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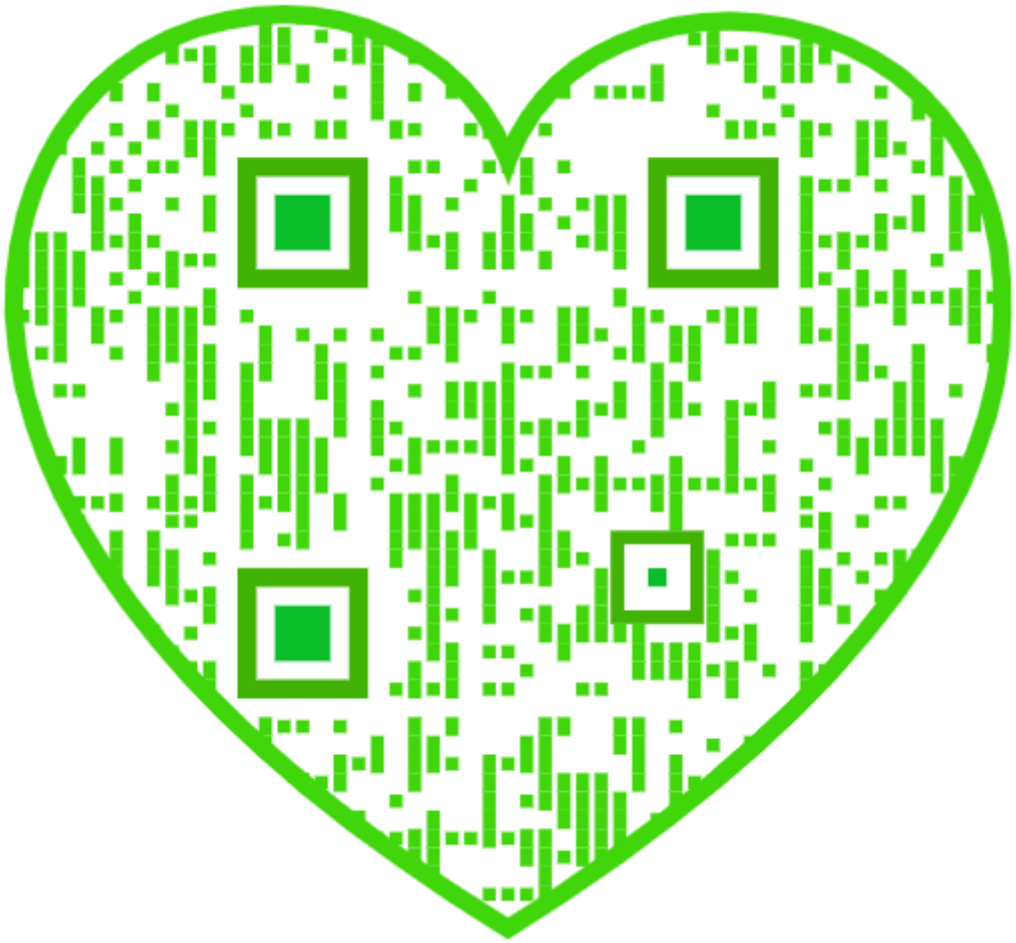

The elements of photography

Frank Roy Fraprie

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Richness
Roundness
Brilliancy
Perfect Balance
Full Tonal Gradation
Sparkling Highlights
Transparent Shadows
True VanDyke Sepias
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PRACTICAL PHOTOGRAPHY, NO. 8

THE ELEMENTS OF PHOTOGRAPHY

Edited by

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Editor of American Photography

THIRTIETH THOUSAND
Revised and Enlarged

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The Elements of Photography

THIS little book is intended for the beginner, and we shall endeavor to express ourselves in as simple and concise a manner as possible. Nevertheless, it is more than probable that the amateur photographer who has had some experience with the camera may find in its pages some useful information. Our idea has been to condense as much practical advice as is possible within the limits of these pages.

A Little about the Chemistry of Photography. — This heading may seem at first glance to be taking up photography at the wrong place, but anyone who is just beginning to take pictures will find it especially helpful to obtain first of all a good general idea of the chemical principles involved in the various processes. In this way he will be enabled to work more intelligently and to avoid some of the mistakes that he might make if working in the dark, using the term metaphorically as well as literally.

Many years ago it was observed that certain substances containing silver were blackened when exposed to the light for some time. Later it was found that when some of these substances were exposed for a very short time, so short, in fact, that no blackening could be noticed, nevertheless a change took place which caused them to darken when treated with certain chemicals. The whole art of modern photography is

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based on these observations. If we should prepare one of these silver compounds, mix it with gelatine so as to form a thick paste, spread it on a glass plate and let it dry, what we would have would be practically the ordinary dryplate. When the sensitive coat or emulsion, as it is called, is spread upon a thin transparent sheet of celluloid, we have the film. This is the principle of the whole thing, though the practical part is more difficult. Some of these silver compounds are much more sensitive to the light than others, and the plate manufacturer has to make up his emulsion so as to get just the right degree of sensitiveness, and then spread it uniformly and evenly on the glass.

Exposing a Plate. — Now, what happens when we make an exposure? You know that white sunlight is composed of several different kinds of light, the seven colors of the rainbow. Some kinds of light, such as the violet, have a very marked influence on the silver compounds, while the red, on the other hand, has but very little effect. For this reason we load the plates into the holder by ruby light. Then we make the exposure, perhaps for fifteen seconds, perhaps for a hundredth of a second. The light, passing through the lens, acts on the sensitive silver film, the amount of action depending, of course, on the amount of light. The amount of light reflected from a white house, for example, would have much more effect than would the light from a green tree.

Purpose of the Developer. — We take the exposed plate into the darkroom and look at it. It looks just as it did before the exposure. Apparently there has been no change. But that a change of some kind has taken place will be evident as soon as we put the plate

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into the developer. The developer contains a reducing agent, that is to say, some chemical which has the power of converting the silver compound into metallic silver. But, and here is the important part of it all, the developer can act only on that part of the sensitive compound which has been already acted on by the light. If we should put an unexposed plate into the developer it would have, for a very long time, no action on it at all. Wherever the strongest light has struck the plate, there the developer acts most strongly, and *vice versa*. Hence, when we develop we get a very black deposit of finely divided metallic silver where the white house was, and very little blackening for our green tree.

Fixation. — After developing the plate, we have, then, a certain amount of metallic silver deposited in it, but we have also a good deal of the sensitive silver compound which has not been acted on by the light, and consequently has not been reduced by the developer. It would spoil the plate to take it out into the light with this still on it, so we must get rid of it. This we can do by means of hyposulphite of soda in the fixing bath. The hypo unites with the silver compound, which is insoluble, to form a soluble compound which dissolves out in the hypo solution. Then we wash all of the hypo out of the film and dry it. This gives us a negative.

Principle of Toning. — The chemical changes which take place in printing are about the same as those just mentioned. If we are using gaslight paper, for example, just the same things happen that did in the case of the dryplate, and we develop and fix in a similar way. With printing-out paper, however, things

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are a little different. This paper is coated with a different silver compound which darkens in the light without the use of a developer. Hence, when this is exposed under a negative, we get the picture in its full strength without development. But, since the paper is not so sensitive as the plates, we have to do this in stronger light, generally in direct sunlight. We might now, if we wished, fix the print in hypo and wash it, and our picture would be completed. But the reddish color obtained in this way is not especially pleasing, so we resort to toning, which consists in replacing the silver image by one of gold, that is, in reality we gold-plate the picture.

The Camera. — The cameras used in photography all combine, in their construction, three elements. First, they consist of a lightproof box; second, they have at one end a lens, and third, at the opposite end a plateholder. The lens casts an image on the photographic plate or film in the holder, and this image or light affects the sensitive surface of the plate, an invisible picture being produced thereon.

The Choice of a Camera. — This is usually the first question which perplexes the beginner, unless a camera has been presented to him. Assuming that a camera is to be purchased, the first decision must be as to whether plates or films are to be used. With the present perfection of photographic processes and apparatus, there is no doubt that the obstacles to be overcome will be fewer and the chances of initial success greater if a film camera is purchased. The operations of loading, focusing and developing are all rendered as simple as possible by improved "all by daylight" methods, and it is almost impossible not to

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produce perfect pictures with a kodak and a developing tank. If, on the other hand, more of the theory of photography is wanted, there are more obstacles to be overcome, and more things to be learned when a plate camera is used. Some study of optics and chemistry is indispensable to the satisfactory manipulation of a plate camera, so that its educational value may be greater.

If a film camera is to be purchased, the nearest dealer will give all necessary advice. The principal thing is to make as large an outlay as possible and get the most elaborate model you can afford, because sooner or later you will change for the better camera if not purchased at first. If economy, however, is necessary, you may purchase even a Brownie or a Buster Brown, with entire confidence that it will do perfectly the work for which it is intended. The cheaper models are fitted with single lenses and have only one speed of snapshot exposure, hence they can be used successfully only in bright sunlight between 9 and 3 o'clock. One of their advantages is that they do not require focusing or setting the shutter. The box forms are simplest of all, but the cheaper folding forms are more convenient in the larger sizes. Those models which have to be focused and are fitted with rapid rectilinear lenses and shutters with many speeds are, however, capable of doing much better work if one is willing to learn to use them properly.

If a plate camera is desired, a large variety is offered by the numerous firms which advertise in the columns of *American Photography*. Catalogs of their cameras may be had from any firm on request, and they will be glad to refer you to their nearest agents. The size is

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a matter that depends on the pocketbook of the purchaser, but should usually not be smaller than $3\frac{1}{4} \times 4\frac{1}{4}$. If possible, get the folding style with focusing attachment, a rectilinear lens, a shutter with a fair number of speeds and iris diaphragm, and a rising front and swingback.

We shall now endeavor to show the advantage of getting an instrument embodying these features. A camera smaller than $3\frac{1}{4} \times 4\frac{1}{4}$ becomes unsatisfactory for contact prints after the beginner has advanced a little, as they are too small to frame or exhibit. A folding camera with groundglass for focusing enables one to see the picture full size on the plate, and to compose it with more accuracy. The folding camera is more convenient to carry, taking up less room than the box variety.

Of course, if one uses a small camera, it is possible to have bromide enlargements made from the negatives and such enlargements are often as good as direct prints made with a larger camera. The majority of amateurs, however, use the 4 x 5 or $3\frac{1}{4} \times 5\frac{1}{2}$, which are now recognized as standard sizes.

Rigidity in the camera is the most essential thing. Many cameras are altogether too flimsy in construction, hard use quickly reducing one of them to an old rattletrap box which will work in a dead calm, but is only too likely to go back on you at a critical moment. Great improvement in other styles has been made in recent years, but the improved view camera still retains, for serious work, the first position. The long focus hand and stand style is more compact, and, in the best makes, almost as rigid and strong. Some cameras are handicapped by poor plateholders. In

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general, those having metal springs to be drawn down by the finger are to be avoided, because they almost always allow the plate occasionally to slip off enough to block the slide, in which case a trip to a darkroom must be made to save the exposure. This defect could easily be overcome by making a tiny metal tongue at right angles to the face of the spring. In any case, however, the holder one uses is governed by the make of camera selected, so it is advisable to choose for good holders as much as for a good box. Another most important point is that the light trap must be absolutely efficient. This is the device for preventing light from leaking into the plateholder when the slide is withdrawn or inserted.

Having, then, a solid view box with suitable holders (and simple but perfectly efficient wooden kits for smaller plates if desired), one is provided with a splendid camera for indoor and copying work, daylight enlarging and other applications, besides its primary use for landscapes. Perhaps the best type is that having both front and back focus, as this kind permits the use of a wide angle lens when necessary. Having this much, the next consideration is the lens.

The Lens. — A rectilinear lens is the best all around lens for the beginner, although more expensive lenses, known as anastigmats, may be had at various prices. Catalogues may be had from all photographic dealers. If one's resources are ample, one of these modern anastigmats is the thing to get. All are capable of giving critical definition to the corners, a quality which is of the utmost value when needed. The common rapid rectilinear, convertible or symmetrical, will not always cover its plate with the large stop. As a

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rule, the corrections for spherical aberration and flatness of field do not extend to the margin of the plate, and one must stop down to U. S. 16 or 32 to get good covering power. This takes much of the atmosphere and roundness out of the picture. An anastigmat, on the other hand, actually working at its full aperture, gives these qualities, and needs to be stopped down only to get depth or to sharpen the foreground properly. With the cheap lens one must use rapid plates which have little latitude; with the anastigmat one can use the slow brands, particularly the red-sensitive plates, without having to resort to long time-exposures.

There are three anastigmats which lend themselves very well to the production of pictorial work with softer definition. The Dallmeyer is so calculated that by unscrewing one of the lenses a uniform softening of the image takes place through the introduction of a small amount of spherical aberration. The Cooke also has this property when the front glass is loosened. The normal lenses, notwithstanding, will give microscopic sharpness when this is desired. The Wollensak Velostigmat f : 4.5 has a diffusing device in the larger sizes. Special lenses are also made for soft effects, such as are desired by more advanced workers who prefer not to have too much detail in the unimportant parts of the picture. An old single landscape lens works well if opened up to a larger diaphragm, and can often be picked up very cheaply. Certain special lenses, generally known as "soft-focus," or semi-achromatic lenses, are particularly designed to possess an unusual amount of spherical aberration.

Other Parts of the Camera. — The shutter is indispensable in these days of snapshot photography,

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and the speeds should be at least as follows: Time, bulb, 1 sec., $\frac{1}{2}$ sec., $\frac{1}{5}$ sec., $\frac{1}{25}$ sec., $\frac{1}{50}$ sec., $\frac{1}{100}$ sec. The stops, of course, are part of the shutter and are nearly as necessary. If an anastigmat lens is purchased, it is advisable to buy the best shutter one can afford, in order to be able to do speed work up to $\frac{1}{150}$, $\frac{1}{300}$ or even $\frac{1}{300}$ second and higher. It is best to test the speeds at frequent intervals, to know what the values really are. All shutters will change in speed, from dust, rust, friction or change of temperature, and in some cases, a change of position of the camera introduces marked variations. In fact, the inaccuracy of shutter markings and variability of speeds are deserving of far more attention than most makers have given them.

The rising front enables one to eliminate an objectionable foreground without tipping the camera up. If, when photographing a high object, it is found necessary to tip the camera in order to get the entire object on the plate, the swingback comes into play and evens up the picture, as will be explained later.

For a tripod choose a solid, well made wooden one, in three or more sections, which with large cameras will pack into the space provided in the carrying case. A metal or wooden tripod stay is often useful, and it is a good plan to see that the legs of the tripod are provided with some device which makes their accidental detachment impossible. The writer's is fitted with brass turnbuckles which spread out the legs rigidly against their pins and strengthen the top remarkably.

The last, but not the least important, part of the outfit is a good exposure guide. Exposure meters which measure the value of the light by the time re-

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quired to darken sensitive paper are also useful guides to correct exposure, and help one most in conditions unsuitable for the use of calculators or tables. Early or late in the day, when the light is changing rapidly, they are indispensable, and their use in interiors is strongly urged. The use of a meter saves one a great many plates. Then, if one uses reasonable care in selecting subjects which are worth while and will make permanently interesting photographs, the expense account becomes very slight.

The Darkroom. — If plates are to be used, a darkroom is usually necessary for loading and developing. For those who wish to use the tank, however, there is a most convenient changing bag on the market. This allows holders to be loaded and unloaded and the tank filled with exposed plates, etc. It is of the greatest value on tour, as plates can be changed anywhere in broad daylight. It is easily possible quickly to change a dozen plates inside the bag in full summer sunshine. The essentials for a darkroom are the absolute shutting out of all outside light, and the providing of a safe light. It is well to choose as large a room as possible, for the sake of ventilation; but a moderately large closet will do, and usually is chosen because of its lack of windows. A part of the cellar may be partitioned off and will be found warm in winter and cool in summer. The light may be placed on a shelf outside. If a room with a window is taken, the easiest way to darken it is to make a light frame which will fit closely inside the window casing. Over this tack two thicknesses of very thick wrapping paper on each side. Dark felt or black silesia may be used instead. Enough material must be used wholly to exclude light. The

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cracks around the door must be looked to and strips of felt tacked around the edges if necessary. When all is ready, no light should be seen after being in the room in the dark for five or ten minutes.

The light used to illuminate the darkroom is red. This is used because the plates are least sensitive to it, but it should be carefully borne in mind that no light is absolutely safe, and that even a red light will spoil a plate if it is left exposed to it long enough. The ruby lamps commonly sold are usually too small, and it is better to make a lantern. Dr. John Nicol described his as follows in the *American Amateur Photographer:* "One I have had in constant use for more than twenty years was a wooden box which cost ten cents — not to the grocer, who gave it, but to his boy for bringing it home. Its size, roughly, is about 22 x 14 x 12 in. I first secured a good kerosene lamp with a 1-in. wick, and in the bottom of the box cut an opening 10 in. square, so that the flame should be about opposite its center. On sides and bottom of this opening were fastened pieces of wood with three grooves, one for groundglass, one for ruby — a plate of the 'copper-flashed' variety, which I was fortunate enough to get in Chicago — and one for a plate of pretty deep orange. The cover, which is now at the back, was hinged, the whole placed on four legs 2 in. high, and in the bottom, which is an end of the box, a number of 1-in. holes were drilled to secure ventilation. A tinsmith made a chimney fitted to slide tightly through a hole in the top and come down to be just over the chimney of the lamp, and bent twice at right angles in the usual way. This sliding chimney I consider a very great improvement on the ordinary form, which just

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enters at the top, as it prevents both smoke, if there should be any, and heat from lodging in the box, making it very hot, and smoking the colored glass. I rarely employ anything but the groundglass (for its diffusing effect) and the ruby; but even with orange added I can read fine print within some feet of the lamp, and every part of my 10 x 8 ft. room is sufficiently light to enable me to find easily anything I want."

To test whether the glass used is safe or not, put an unexposed plate in your plateholder, draw the slide half out, and expose it to the light of the lamp at a distance of 2 ft. for five minutes. Then develop. If the two halves are alike, you can safely develop at 2 ft. from the lamp. If one half develops darker than the other, you must get another red glass, or add a sheet of orange glass or paper, or you will fog your plate when developing at this distance.

Loading the Camera. — The loading of a film camera is accomplished in daylight, and full directions accompany each camera when sold. The details vary somewhat for different types of cameras, but are easily learned. If you buy a second-hand film camera, send ten cents to the maker of it and ask for an instruction book. Be sure to give the exact name of the camera as stamped on the inside of the removable back.

Plates must be loaded in the darkroom. The operation should be performed as far from the light as possible, and it is well to learn to do it in absolute darkness, so that it may easily be done in any accessible dark place when away from home and the ruby light, if the changing bag is not carried. The changing

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bag is most useful, for one can readily learn to load entirely by touch. The empty plateholders should be piled up carefully together, and it is well to draw out all the slides and dust out the holders before opening the box of plates. A wide, soft brush is generally used for this purpose and should never be employed for anything else. It should be used gently, especially in cold weather, or the electricity generated by friction will attract dust instead of removing it.

When all is ready, open the plate box by passing a knife or the thumbnail around the four sides to break the paper seal. Take off the outer box, turn upside down and take off the next box. The plates will now be found wrapped in black paper. They are packed face to face in pairs. The sensitive side is duller when light is reflected from it. This side should be out in the plateholder. Dust each plate gently, and lay it in the plateholder, forcing back the end spring if necessary, so that the plate will drop into place. Then put in the slide, taking care that the white side of the wooden end is out. This denotes an unexposed plate. After exposure, the slide is replaced with the black side outermost, thereby preventing double exposures. After the holders are loaded, the plate box should be closed and all sensitive material carefully put away before the door is opened.

The plateholders should be numbered, and a careful record kept of each exposure, with full details of light, time, etc. This will be of great help in developing; and if the records are carefully studied in conjunction with the negatives, a good knowledge of exposure, one of the most difficult subjects in photography, will soon be gained.

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The Parts of the Camera. — A camera is a light-tight box arranged so that the plate may be placed at the proper distance from the lens. This is usually accomplished by making the sides of flexible leather called the bellows. The bellows folds up like an accordion for convenience in carrying and may be extended so as to bring the lens to the proper distance from the plate. This distance is ascertained by looking at the image as projected on a groundglass which forms the back of the camera and occupies the same position as the plate will when the plateholder is inserted. The back of the camera is usually provided with a swing-back which allows the plateholder to be held in a vertical position even when the camera is somewhat tilted.

At the front of the camera is the lens, through which rays of light enter and are brought to a focus on the surface of the sensitive plate. It is provided with a set of diaphragms or stops, which allow the amount of light passed to be diminished at will and also, to get better definition, confine the light used to that which passes through the center of the lens, which forms the most perfect image. At present almost all lenses are provided with iris diaphragms, which may be opened and closed by moving a lever or a ring on the outside of the lens mount.

In order to regulate the time of exposure, a shutter is used which may be opened or closed at pleasure and may be set to give automatically exposures of various lengths. The lens may usually be moved up and down, and sideways, for certain special purposes. The front of the camera is also often fitted with a focusing scale and a finder, to be used instead of the ground-glass in instantaneous work.

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Focusing. — In taking your first picture with plates, do not select the family group, the dog, the cat, or the baby. While they are probably of absorbing interest to you, they are all very difficult subjects, and you had better postpone them until you are a little more proficient. With a film camera, you may be able to get such subject early in your career, if you choose a bright day, and keep them still while you snap. The pictures are very likely to be entirely devoid of composition, however, and interesting only to the family.

Assuming that you have a plate camera, start to take some convenient stationary object, partly well lighted and partly in shadow. Let us assume that it is a house with the sun on one side and shadow on the other. Set your camera up at a convenient distance, probably across the street. Do not get exactly in front of the center, but take it cornerwise. This gives a much more interesting picture, because it shows two sides, each in receding perspective. Screw the camera to the tripod, extend the bellows until the pointer is at 100 on the focusing scale, set the shutter to time and open it. The largest opening of the diaphragm should be used. Now cover your head with the focusing cloth and look on the groundglass at the back. You will see the image on, not *through*, the groundglass, and upside down. It will probably be almost sharp. Move the lens slowly forward and backward until perfect sharpness is obtained. It will sometimes happen that the foreground and background will not both come sharp at once. This can be improved by using a smaller stop, but it is sometimes necessary and often desirable to focus on the principal object and leave other planes a little out of focus. For technical excel-

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lence, however, it is usually necessary to focus as sharply as possible all over the plate.

If there is a house or tall building at hand go as close to it as possible still to get the entire width on the plate, level the camera and focus. You will at once notice that the top of the house is not on the ground-glass. To get it there you will have to tip the camera. The top of the house will now appear narrower than the bottom. This is a case where the swingback comes into play. Use the swingback to make the ground-glass exactly upright, and focus again. The rising front, the swingback and the stops are three things that are the least understood and the least employed by the majority of amateurs. The proper use of them would improve many pictures.

Use of the Focusing Scale. — The viewfinder necessary with fixed focus cameras is also used on folding cameras. In fact, it is used on all amateur cameras and on many professional cameras, too, for it is not always convenient to put the camera upon a tripod and focus it through the back, so we use this miniature camera, which we call a viewfinder, in conjunction with the scale on the side of all folding cameras. We put the pointer opposite the number of feet we think the object being photographed is distant from the camera, and then find our subject in the finder, set our shutter, withdraw the slide from the plateholder and snap the shutter. If the camera is fitted with an automatic shutter we do not need to set it, because it is always ready to snap. Or, if we are using a film camera, such as a Kodak or an Ansco, we have no slide to withdraw from the plateholder because our film is always ready to be exposed, after having been wound

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into proper position immediately after each exposure.

Care of the Camera. — The lens should receive as much care as possible. Treat it as a man does his eyeglasses. In most cameras the frontboard is removable, the lens and shutter coming off in one piece. Have a box made, lined with black velvet, to hold these, and you will be repaid later for the extra care taken. In cleaning or dusting the lens, remember that the surface of the glass is comparatively soft and highly polished. Clean your lens with Japanese tissue paper, as this will not scratch the glass. Remember that the lens is the eye of the camera and must be treated as the most delicate part.

The shutter will need very little attention if not roughly handled, but if it gets out of order should be repaired by a reliable dealer or sent direct to the maker.

The camera needs a trifle more attention. The bellows requires frequent dusting inside and out with a damp cloth, or your negatives will show specks. The bellows should be tested now and then for pinholes by closing the shutter and placing a plate in a holder in the camera and withdrawing the slide. Let the camera stand for, say, ten or fifteen minutes in bright sunlight. If there are any leaks anywhere they will show in development of the plate. Should the plate develop up clear, you may consider the camera safe. Another method is to place an electric light bulb on a flexible cord inside the camera in a dark room. Not only holes, but thin places, can then be easily found for timely repair.

Taking the First Picture — Films. — For taking pictures after we have chosen a camera, how shall we go

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to work? There are two answers, according as we have a film or plate camera. As the first camera of most people is a film camera, we will consider this first. Before loading the camera, or having it loaded, first let us see how the shutter works. Open the camera, according to the directions which will be found in the instruction book, and then snap the shutter several times, watching its operation both from the back and from the front. Move the slide or lever which controls the stops. The largest one is used in all but exceptional cases. Now find out how to make time exposures, or those in which the shutter is left open for a considerable period compared to the usual snapshot exposure, as for instance in a dark interior.

Having become perfectly familiar with the use of the shutter and learned what all the projections on the outside of the camera are for, it is time to load. Open the camera, if not already open. You will find an empty spool at one side, on which to wind the film. Your full spool is marked "top" on one end. Be sure that this is at the top of the camera when you put it in. Directions for this operation will be found in the book of instructions, and the guides for the film in the camera are marked so that there is no possibility of mistake. Roll the black paper one or two turns on the empty spool, and close the camera. Now you may, if you desire, turn the film by the key on the outside of the box until the number "1" appears through the red window in the back of the camera, but it is wise not to do this until you are ready to take the first picture, and in this way avoid the danger of accidentally exposing the first film by snapping the shutter too soon.

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Do not leave the camera in the full light of the sun any more than is necessary. Of course, the makers have made it as nearly light-tight as possible, but there never was a construction of wood and leather that the sun could not find a way through in a moderate time. So, if you go yachting, put the camera in the cabin, or keep it well covered, instead of leaving it in the stern sheets all day.

The cheaper film cameras are intended for use only on a bright day. The shutter is set to a speed that will give good results on ordinary landscapes on sunny days in summer from 9 to 3 o'clock, with the largest stop. Before and after these hours, fasten the camera on a tripod and use the smallest stop and the quickest possible "time" or "bulb" exposure. This may be tried between 8 and 10 and 3 and 5 o'clock, but the results will be uncertain. Before and after these hours, longer time exposures will have to be given, and the proper times can be learned only by experience, or by reference to the *American Photography Exposure Tables* or the exposure meter. If pictures are to be taken in sunlight on the water, use the medium stop for the four middle hours of the day, and the large stop for two hours before or after these limits. Water pictures with the sun covered need about the same exposure as a landscape with the sun out. Landscapes with the sun covered will require, at noon, a small stop and quickest time-exposure you can give, or a slow snap at stop U.S. 4 (or *f* 8). For interior work no rules can be given, but the smallest stop should be used, to secure the sharpest picture possible, and the time will range from 20 to 40 seconds in the middle of the day to

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two minutes or more in the morning or late afternoon. Exposures in the winter have to be twice as long as in summer.

Of course, if a time exposure is to be given, it will not be possible to hold the camera in the hand, as the result would be a blur. If a tripod is not at hand, a box, a fence, seat, or stone may be used as opportunity offers, but some support is necessary. When the roll of film is used up, it is rolled completely off the spool, and the camera is opened and a new roll substituted. The exposed roll should be wrapped around with rubber bands very securely or the end pasted down, and it should not be carried in the light. Keep it in a dark place until it is developed, or light may creep in at the ends of the roll and the film be fogged on the edges. The film is now ready for development. Most beginners have their developing done, but the appearance of the image is so interesting and instructive that you will lose one of the best parts of the picture-making if you do not learn to develop your own negatives.

The First Picture with Plates. — The beginner who possesses a plate camera may have one with a fixed focus lens and a single-speed shutter, in which case the manipulation, as far as the exposure goes, is not different from that of a film camera. If the camera is of the "hand and stand" type, a tripod is necessary, and it should be a firm one. For quick work, such as marine views, street scenes, etc., the camera may be focused by the scale, and the picture located in the finder. Whenever it is possible, as in landscapes, portraits and architectural views, the tripod should be used, and the focusing done on the groundglass.

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In taking high buildings, it may be necessary to tip up the front of the camera in order to get the whole of the building in the view. When this is done, it will be necessary to tip the swingback enough to keep the plate in a vertical position, otherwise the lines of the building will converge toward the top, making the structure appear to be falling backward. If the swingback is used, a small stop is required in order to bring the whole plate into focus, as the top of the plate has been brought nearer the lens than the bottom, and they cannot both be in focus at the same time with a large stop. The exposure is greatly lengthened by this, but in a crowded street an exposure of several seconds with a very small stop is often desirable, as no trace then appears on the plate of the persons who had walked rapidly across the field of view, and the street appears to be empty.

In taking pictures toward the sun, be sure that the rays of the sun do not fall on the lens, whether it or its reflected light can be seen on the ground-glass or not. Shade the lens with the hand or a card until the shadow covers the lens, taking care that the shade itself does not appear in the picture. An adjustable lens shade can be bought for a small sum, and is a valuable addition to the camera.

Exposure. — The problem of exposure with a shutter of many speeds is one which will require much study, and it is impossible in the space remaining at our disposal to enter thoroughly into this question. The best way to learn exposure is to buy and study carefully No. 1 of this series, *The Secret of Exposure*, or to use regularly the *American Photog-*

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raphy Exposure Tables. In either case, you should keep a careful record of all exposures and the results. You will then be able to locate errors of exposure, to allow for the variations of your shutter from the marked speed, and after some time to feel reasonable confidence in your own ability to gauge varying conditions of light.

Stops or Diaphragms. — With regard to the stops, it may be said that there are two systems in use for numbering them. The Uniform System is used on all cheap cameras made in the United States, and in this system the area of each stop is inversely proportional to the number. U.S. 16 is twice as large as U.S. 32, admits twice as much light and requires half the exposure. U.S. 16 is the same as $f : 16$, but in the f system $f : 32$ is one-fourth as large in area as $f : 16$, and requires four times the exposure.

The meaning of the numbers given to the stops is very simple. The stop marked $f : 8$ has a diameter of opening one-eighth of the focal length of the lens, that is, one-eighth the distance from the optical center of the lens to the groundglass. Those numbered $f : 16$, $f : 32$, and $f : 64$ are, respectively, $\frac{1}{16}$, $\frac{1}{32}$ and $\frac{1}{64}$ of the same distance. If the distance between the groundglass and the lens is 8 in., then the diameter of $f : 8$ will be about 1 in.; that of $f : 16$, $\frac{1}{2}$ in., $f : 32$, $\frac{1}{4}$ in., and $f : 64$, $\frac{1}{8}$ in.

It will be noticed that although $f : 8$ is twice the diameter of $f : 16$, we multiply the necessary exposure for $f : 8$ by four, in order to obtain the correct one $f : 16$. The reason for this is, that the *area* of $f : 8$ is four times that of $f : 16$, and the amount of light admitted is therefore four times as much with the

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larger stop. This is a matter which is not understood by most amateurs, and in many cases where it is understood, the exposure is seldom given in relation to the stop used. We give here the correct exposure for each stop, supposing $f : 8$ to require one second; $f : 8$, one second; $f : 11$, two seconds; $f : 16$, four seconds; $f : 22$, eight seconds; $f : 32$, 16 seconds; $f : 45$, 32 seconds; $f : 64$, 64 seconds.

When possible, stop down, so as to increase the exposure. This can only be done when photographing stationary objects. The reason for this is, that if you have a subject the correct exposure for which is one second, and you overexpose by giving $1\frac{1}{2}$ seconds, you have given 50 per cent more than correct time. If the correct exposure is only $\frac{1}{4}$ second, and you overexpose by giving $\frac{1}{2}$ second, you have given 100 per cent more than correct time. Therefore, the longer exposure gives you more latitude and you are not so liable to make mistakes.

If you have a symmetrical lens and remove the front half to get a picture twice as large, the exposure must be four times as long. If you use a color-screen and isochromatic plates, you must give from three to five times the normal exposure, according to the depth of the screen. This increase, or factor, is supplied by the maker of all good screens.

Overexposure Preferable.—We are in favor of overexposure rather than underexposure, for the following reasons: An overexposed plate, if treated as such in development, can be made to give a good picture, unless it is too badly overexposed. An underexposed one has parts, for instance, the details in the shadows, which are practically unacted upon by the light, and

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no developer known will create detail where none exists.

In calculating the exposure always do so with the lens wide open, forming your judgment by the amount of light in the shadows. Disregard the highlights; they will come out all right in the development. When you have focused and decided on the exposure as above, stop down to get the required sharpness, and figure your exposure for that particular stop as given by the *Tables* or by the meter.

Developing the Picture. — After we have taken the first batch of pictures and got home with them, we are naturally anxious to see the result of our efforts. For this purpose, we must develop the plates or films, and so must have a darkroom. Not all of us have the space to spare for a specially constructed darkroom, and so we must employ some makeshift. If we can restrain our impatience until nightfall we will find that almost any room in the house is, or can be made, dark enough to allow of developing in it. We will, if possible, choose a room which has running water in it, such as the kitchen or laundry. It is not absolutely necessary to have running water in the darkroom, for the plates are insensitive to light when they arrive at the stage of washing, but much water is used in photography, and it is convenient to have it always at hand.

The darkroom must be illuminated with light of a color which will affect the plates as little as possible, and this is, generally speaking, red. Cheap red lanterns are usually a bad bargain, and it will be better either to purchase a really good one at a

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fair price, or to make one according to the directions given on page 13 of this book. As a makeshift when a lantern is not to be had, proceed as follows: Buy a candle and a sheet or two of orange postoffice paper, which may be had of any large dealer in photographic supplies. Roll this into a cylinder about 5 inches in diameter and 18 inches high, using preferably two thicknesses of paper. Then light the candle, place it on the developing table, and put the roll of paper around it. In this way the writer has developed many hundred plates, and found it perfectly safe for ordinary plates or films. It should not be used with an uncovered tray when developing orthochromatic plates or films. For these, and very rapid plates, keep the tray covered during the whole progress of development, examining the plates as little as possible. In fact, it is better to do this with any plate and light. Some light shines out of the top of the cylinder, but if the ceiling is moderately high, and not too white, no harm results from this. If possible, in a darkroom, have the light outside, as this keeps the temperature lower and the air much purer. In this case, or for a homemade lantern, use one sheet of ruby glass and one of orange paper, renewing this latter at least once in six months.

Having settled the question of light, we may proceed to develop our plates. It is no longer usual amateur practice to develop films in the darkroom, as the developing tank does the work better and much more quickly in daylight. If, however, it is desired to inspect the process of development, the simplest way is to develop the film in a long strip, passing it backward and forward through a deep dish of de-

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veloper, meanwhile holding it by clips made for the purpose. Before this is done, the film may be soaked in water until it is limp, to avoid streaks. The light must be very dim for this purpose, as modern films are orthochromatic, and it is far safer to develop them mechanically, as thereby the danger of fogging is avoided. If it is desired to develop the films singly, cut them apart in accordance with directions on instruction sheet packed with the films.

As to the developer to be used for plates, there are many excellent ones. The best plan for the beginner is to use the developer recommended by the maker of the plates, the formula of which is enclosed in the box. The maker is usually interested in having his plates do the best possible work, and has expert chemists in his employment to determine the best developer for his emulsions. Every emulsion requires a suitable developer, and if you buy somebody's prepared developer, you may get satisfactory results, and you may not.

Mix your own developer. If you have no scales, take the formula to your druggist and let him prepare it for you. As soon as you can, however, if you intend to stay in photography, buy a balance and mix your own solutions. You will soon save enough to pay the cost of the scales. If you must buy a prepared developer, get one made by a reliable maker from chemicals guaranteed to be chemically pure. Metol-hydrochinon is the most popular of all developers, but metol is poisonous to a few people, so if your fingers swell up and itch after developing, stop using metol. Metol poisoning may be avoided by thoroughly rubbing lanolin into the skin of the

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fingers, especially around and under the nails, before developing, so as to render the skin waterproof.

When ready to begin development, make sure that the darkroom is free from outside light, and lay the plate, after dusting it, in the developing tray. The developer should be in a measuring glass or tumbler, using about four ounces for a 4 x 5 tray, and is to be poured over the plate so that it will cover the whole surface at one sweep. With a little practice you will be able to do this without trouble. If the plate is not all covered at once, some portions of the image may appear sooner than the rest, leaving markings which cannot be eradicated, as the parts which start later will never catch up in density.

As soon as the plate is covered with developer, go over the surface with a tuft of cotton to break any air bubbles which may have formed, which would otherwise cause transparent spots in the negative. Now, as the plate lies in the developer, after a little while you will see dark spots appear on the creamy surface of the plate in the places where the strongest lights have acted on the silver compounds. Soon the outlines of the subject will appear, and then the halftones and the details in the shadows. By the time all the details in the shadows come out, if the plate is properly exposed, the picture will seem to "bury" itself and will be covered up, as it were. When this occurs, take the plate from the dish and look at the back. If the highlights of the picture show on the back, development is complete, and the plate may be rinsed in clean water and fixed.

Incorrectly Exposed Plates. — If a plate is not properly exposed, it will not behave normally in the

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developer. An underexposed plate will come up very slowly, and the details on the shadows will not come out as they should. There is really no way to save an underexposure. The usual way of continuing the development until the highlights are all blocked up, in the vain hope of forcing more details, is the worst thing that can be done. The prints from such a negative will be very hard — "soot and whitewash," as they are generally called. The only remedy for great underexposure is to take the picture again.

Overexposure is recognized by the image flashing up quickly as soon as the developer is poured on. The usual tendency here is to take the plate out as soon as the image is buried, and fix. The result is a thin, flat negative which is good for nothing. The best way to save the plate is to take it out of the developer as soon as it flashes up and wash it well under the tap. Then put it back into a strong developer with plenty of bromide for a minute or two and a passable negative may be obtained. If the overexposed plate is developed in normal developer for the normal length of time, it will give a negative with full gradation, but so dense that it will take a very long time to print.

Factorial Development. — This is a system invented by Alfred Watkins, an Englishman, and has many advocates. As the result of many experiments made by two Englishmen, Hurter and Driffield, it has been established that the character of the negative is fixed by the exposure, and that no modification of the developer will change this. Working from this principle, Watkins found that there is for every developer a factor, which, multiplied by the time it takes the image to appear, will give the correct time for development.

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For example, the factor of hydrochinon is 5. If you cover an exposed plate with hydrochinon developer made up in any proportions or of any strength, and count the number of seconds which elapse before the first trace of darkening appears on any part of the plate, and then multiply this number of seconds by five, it will give the number of seconds the plate must be left in the solution to get the best possible negative. If the image appears in 40 seconds, for instance, you must develop for 200 seconds from the time of pouring the developer on the plate. The factor for metol-hydrochinon is about 14; for metol, 30; for ortol, 10; for eikonogen, 9; for pyrocatechin, 9. Many makers now publish the factors for their powdered developers or for the formulas recommended for their plates. "The Watkins Manual" gives full particulars of "time" development as well as of the factorial system.

Tank Development. — Although factorial development is very popular it requires close attention and continuous observation in the red light, which many people find trying to eyes and nerves. There is another application of Hurter and Driffield's principle, which has not yet attained all the popularity it deserves. This is the method known as tank or stand development. For this method it is necessary to have a box in which the plates may be developed in a vertical position. There are now many convenient tanks on the market. The plates are usually held in a basket which can be easily withdrawn for the purpose of examination. Fixing boxes, of glass or rubber, while they serve equally well for development, offer no facilities for examination of the plates, which is sometimes necessary, though very good average results are ob-

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tained by developing for a fixed time (depending on the temperature) with a standard developer.

The pyro tank powders sold by the Eastman Kodak Company for 20-minute development are the most convenient, particularly on vacation trips, etc., but negatives of the most perfect quality are easily obtained by using the following formula:

Pyro-Metol Solution

Water to make	29 oz.
Metol	½ oz.
Potassium metabisulphite	120 gr.
Pyro	275 gr.
Water to make	29 oz.
Sodium sulphite, anhydrous	3 oz.
Sodium carbonate, anhydrous	2 oz.

For use as a 20-minute developer for speed films and film packs, at 65 degrees F., take 1 oz. of each and 22 oz. of water.

The developer for tank development may be very dilute, so that the process of development, instead of taking a few minutes, may last from one to ten hours. The time of development may be regulated by the dilution of the developer used. The developer can be made so weak as to take all day or all night for development if desired; but if this is done, the proper developer to use is glycin. In fact, many people think this the best developer for tank development. It certainly gives excellent results. A suitable formula is:

Water	1 oz.
Sodium carbonate, anhydrous	1 gr.
Sodium sulphite, anhydrous	1 gr.
Glycin	1 gr.

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Any desired quantity may be made up in these proportions.

Thermo Development. — Mr. Alfred Watkins, the inventor of the factorial system, perfected the time and temperature method by furnishing complete tables of the relative development speeds of plates. He classes them from VVQ (very very quick) to VS (very slow). For instance, at 60 degrees Fahrenheit, in a standard M.-Q., the VVQ plate takes 1¾ minutes and the VS plate 11½ minutes to reach the same stage of contrast. "The Watkins Manual" gives complete formulas and directions, including a method by which any user can draw up for himself a table of the times of development for all temperatures for his pet developer and any plate. The code letters indicating development speeds are given on the speed card issued with Watkins meters. Only a brief explanation can be given here, as space will not permit a full treatment. The *American Photography Thermo Development Card*, price 25 cents, gives full instructions, development speeds and formulas, for preparing developing solutions.

Development being entirely by temperature, no inspection of the plate is needed, so no ruby light is required. The developer is mixed to suit the development speed of the plate and flowed over it in darkness. The tray is then covered and left until the required time is up, when it is removed in darkness (or ruby light if preferred) to the fixer. The thermometer, a watch, and a set of tables take the place of judgment; yet the user can control the contrast to suit his own taste by simply classing the plate higher or lower in the scale. The advantages of this plan are so great

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that few who try it with care and compare the uniformity of results with the uncertainties of the old methods ever wish to return to the latter. It is the only satisfactory method of handling panchromatic or other highly color-sensitive plates, as the danger of light-struck plates is entirely eliminated. It applies to all makes of plates and films in either tray or tank.

Film Development. — The day of developing films by hand is past. The developing tank sounded its knell. With this device, films are developed in full daylight anywhere. The roll of film is taken out of the camera and the black paper cautiously unwound, taking care not to let the roll loosen, until the gummed paper on the end of the strip of film can be seen; this is then wet and fastened to the black paper backing, and the film wound up again. The end of the black paper on the roll of film, which has been inserted in the carrier of the changing box which accompanies the tank, is thrust through the split rod, and the crank turned to wind the paper off the roll and on the rod until the mark "Stop" on the roll is reached. The celluloid apron is then fastened on the rod, the cover placed on the box, and the handle steadily turned until the film is wound up inside the apron. The whole is now removed from the box and lowered slowly and steadily into the tank of developer, moved up and down once or twice to dislodge possible air bubbles, and then the tank is covered.

Development takes twenty minutes at 65 degrees, the tank being turned upside down two or three times to ensure even development, and the film is then washed and fixed.

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Fixing. — To fix a plate or film, we immerse it in a solution of hyposulphite of soda, usually called "hypo," until all the unchanged silver bromide, the yellow part of the film, is dissolved away. This takes ten or fifteen minutes in a solution of one ounce of hypo to four of water, or a good commercial acid fixing bath, such as is put up by several reliable firms. The plate is not fixed when all the yellow color is gone, but must be left some minutes longer. This is because the hypo first changes the yellow compound to a colorless one which will not dissolve in water, and then changes this to another colorless one which water will dissolve. Time must be allowed for this second change, which requires as long as the first one.

Washing. — The plate is now no longer sensitive to light and has become a negative. It must be thoroughly washed, which operation may be done in daylight. The washing should last an hour in running water, or the water should be changed twelve times at intervals of five minutes. It is the best kind of economy to buy a good washing box for plates. The permanency of the negative is dependent upon thorough fixing and washing, and these processes should not be slighted.

Washing and Drying Films. — The best way to wash a strip of film is to fasten it with push pins to a board longer and wider than the strip and to float the whole, film down, in about a foot of water in a bathtub, changing the water four times at intervals of fifteen minutes. Another good plan is to make a trough of the board by nailing strips along the edge to confine the water, and then hanging the board by one end under the cold water faucet. The flow can be

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regulated so as completely to cover the film, when 20 minutes' washing of each side should suffice to remove every trace of hypo.

Non-curling films are coated on the back with gelatine, so nothing must be allowed to touch them while they are drying. The strip may be pinned to a shelf away from the wall and a metal clip attached to the lower end to keep it straight. Before hanging it up, pass the film between the fingers (or, better, use a rubber squeegee) to remove all drops and superfluous moisture, and thus ensure good, even drying without marks or streaks. It is best to dry films in a current of air in a place quite free from dust, but not in too hot a place.

Drying Plates. — After glass plates are washed they are cleaned carefully, front and back, with a wad of wet absorbent cotton to get all the surface water off, and are then stood up to dry. Economy dictates the use of a good drying rack, which can be bought for about 25 cents. The plates should not be nearer together than 1 inch or, better, 2 inches, or they will dry too slowly. Set the rack where there is no dust, but at the same time in a good current of air, never in the sun or too near artificial heat.

The process of development is one of the greatest stumbling blocks to the amateur. Even if the plate has been exposed correctly, it may be spoiled in development, fixing, washing, or drying, so be careful. Use only fresh chemicals and do not allow too much light from the ruby lamp to strike the film before the plate has started developing. Our 10-cent booklet, *Practical Development*, contains many points for the beginner.

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Printing Processes. — After the negative is dry, the next step is making the print. For this there are innumerable processes of varying grades of complexity. Among these may be mentioned blueprint, self-toning, gelatino-chloride or printing out paper, and the various gaslight papers, as suitable for the beginner; while collodion, bromide, platinum, carbon, gum-bichromate and bromoil are much practised by those who have had longer experience. We will confine our present remarks to the four first mentioned.

Blueprinting. — This is the easiest of all printing processes, and gives good results from broad, sketchy negatives. It is especially good for cloud and sea views, but is less suitable for subjects with much fine detail. It is also much used for making proofs, to see whether the negative is worth printing on a more expensive medium.

The paper can be bought in sheets of any desired size. It comes in tin cans, which should be kept tightly closed, as dampness soon injures the paper. The side to be printed on is light green or yellow in color, and should be placed in the printing frame in contact with the film side of the negative. Print in direct sunlight until the shadows are a deep bronze color, examining the print in the shade by opening one-half of the printing frame. One or two trials will show the exact depth necessary to print. Then place the print in cold water, face down, for a few minutes, wash in running water for about twenty minutes, and pin up to dry or lay on a clean photographic blotter, face up.

The paper is easily and cheaply prepared at home.

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Almost any kind of well-sized paper without ruled lines may be used. Good writing paper is very satisfactory. The solutions are made at follows:

A

Water	4 oz.
Red prussiate of potash	6 dr.

B

Water	5 oz.
Citrate of iron and ammonia	7½ dr.

Keep the solutions well corked and in a dark place. To use, mix equal parts of A and B and apply to the paper with a tuft of cotton, coating the paper first in one direction, which will make it look streaky, and then across the first lines, smoothing out the streaks. This should be done quickly, and the paper dried in a warm place where daylight cannot reach it. Gaslight or lamplight will not affect it. The best results will be obtained by using the paper while fresh.

Gelatine Papers. — To get a sharper and clearer print than that given by the blue paper, with a glossy surface in addition, the paper to use is what is often called P.O.P., or printing out paper. There are many brands on the market, and there is little choice as to results. As each brand has its own peculiarities, however, it is better to adopt one make and get used to it.

The paper is printed the same as blueprint paper, except that thin negatives should be printed in the shade or under tissue paper. The paper is considerably faster than blueprint paper, and should be examined and handled only in a subdued light.

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If this precaution is not observed the highlights may be degraded or darkened. The printing has to be considerably darker than desired for the finished print, as the image becomes lighter in the subsequent operations. The exact shade must be learned by experience, and as it varies somewhat with different papers, this is another argument for sticking to one brand and learning its peculiarities.

When the prints are made, they should be put in a dark place until enough are done to make it worth while to tone them; at the same time they should not be kept more than a day before this is done, as the paper spoils if kept too long after printing, and will not tone evenly.

Toning. — The object of toning is to improve the color of the print by substituting gold for the original silver of the print. It thus becomes brown or purple instead of the foxy red color of an untoned print. The first step is to wash the prints thoroughly in ten or a dozen changes of water to remove all the free silver. This causes the wash water to assume a milky appearance at first, and washing should be continued until this no longer appears. This washing is of the utmost importance, and may last about half an hour.

To make the gold stock solution, buy a fifteen-grain vial of chloride of gold and dissolve the contents in fifteen ounces of water. This solution will keep a long time, and one ounce contains exactly one grain of gold. For the alkali solution dissolve one ounce of borax in eight ounces of water. This will also keep for a long time. To prepare the toning bath, take one pint of distilled water and add to it

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four drams of the gold solution and about two drams of the alkali solution. Put in a piece of red litmus paper, and if the bath is right it will turn the red litmus blue in about four minutes. If the paper does not turn in this time, add a few more drops of alkali and test again. Be careful not to get in too much alkali, as if you do you will have to neutralize with acid. The bath should be made up the day before and thus allowed to "ripen." When ready to tone, place the washed prints in the bath, one at a time, and keep them moving, continually taking the bottom print out and placing it on top. Thus uneven toning is prevented. Do not have more than five or six prints in the bath at a time. The toning should be finished in about ten minutes. If it takes much less, add more water. In hot weather the prints are likely to blister if the solutions are not kept cool. Ice may be used for this purpose, or a few drops of saturated solution of alum may be added to the wash water, taking care not to use too much.

After the print has reached the desired color, it must be fixed. For this purpose use a solution of one ounce of hypo in twenty ounces of water, and keep the prints well separated in this bath for twenty minutes. Then wash well in running water, an hour at least, or fifteen five-minute soaks, keeping the prints well separated, in as many changes of water.

The Combined Bath. — While the combined bath as ordinarily made up, containing salts of lead, gives beautiful tones, even after the gold is exhausted, the prints made with it are not permanent, and it is not to be recommended if prints are desired to last more than a few months.

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Glazing. — If prints with the smoothest possible surface are wanted, they should be squeegeed to a ferrotype plate and allowed to dry in contact. When thoroughly dry they will peel off easily with a perfect polish. The ferrotype plate should be absolutely clean. A thorough washing with soap and water and rinsing with clean water will usually ensure this condition, but if the prints stick, it may be necessary to rub the plates with a solution of wax in benzol or paraffine in benzine. Only a little should be used, and then well rubbed off. The wet prints, which take a better surface and are less likely to stick if dried before glazing, are laid on the plate and rubbed into perfect contact with a rubber roller. It is advisable to lay a clean blotter over them during this process to absorb the superfluous water squeegeed out by the roller. The plate is then left to dry in a warm place, and when completely dry the prints will spring off easily when the point of a knife is inserted under one corner. Squeegeed prints should be inserted in a slip-in mount, as the polish is lost if they are mounted with a wet mountant.

Self-toning Paper. — Some very satisfactory papers are made with gold already in the coating, so that they require fixing in hypo only. It is only necessary to print them somewhat deeper than required, immerse them in weak hypo for a few minutes, wash thoroughly, and dry. Full directions accompany every package, and the paper is almost as simple as blueprint to work, and gives much more pleasing results. It can be had in the form of postcards, as can all the papers previously mentioned.

Developing Papers. — The popularity of develop-

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ing paper is mainly due to the fact that it enables the user to obtain prints from their negatives by artificial light. Its manipulation is very simple. A sheet of the paper is placed, face downwards, on a negative in the frame, this operation being carried on in subdued gaslight. The exposure, which varies with the density of the negative, will last from ten seconds to five minutes before a bright lamp or gas jet. The paper is then developed like a plate, the image appearing somewhat more quickly, and when the desired color is obtained, an immersion of ten to fifteen minutes in an acid hypo bath to fix the image completes the operation. The usual washing, of course, follows. Perhaps the greatest proportion of failures results from improper exposure.

Use Test Strips. — The best way to ensure success, no matter what the printing light, is to test each and every negative with strips of paper before attempting full size prints. Lay the strip on the negative so as to cover the most critical parts, the highest light and the darkest shadow. Make a trial exposure and develop. Do not proceed to regular printing until an exposure which brings out the details in the whites is found.

It is better to cut a sheet of 4 x 5 paper into several strips and use them all in tests than it is to print the whole sheet and have to throw it away because the whites are yellow or the blacks dirty in tone.

Developer for Gaslight Paper. — In every package of developing paper you buy you will find a formula for making your own developer. "M.Q." developer is good for any paper of this kind. It comes in tubes in powder form; also bottled in liquid form. The

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tubes are so cheap that many prefer to buy them instead of making up their own developer. Amidol gives a beautiful blue-black, but does not keep well.

Trimming and Mounting. — The final steps in the making of a photograph, the trimming and mounting, are by no means the easiest. The exercise of due neatness and skill will make itself fully repaid in these final operations.

It may be that after washing and drying the print, it has curled so much as to interfere with the trimming. Such prints may be easily straightened by drawing the edge of a ruler across the back of the print, from corner to corner, lifting the print as the ruler is moved along. If the paper is very thin, or has a tender film, it is better to use a round pencil rather than the sharp edge of a ruler, which would be likely to cause cracks in the film.

Most beginners trim their first prints with scissors. Unless large shears are used and the cut is made with skill, the result will be anything but a straight line. If you are not the fortunate possessor of a regular trimming board, the next best thing to use is a sharp knife. Lay the print on a piece of smooth glass or on a piece of zinc and guide the knife by a ruler or by a glass form, which is sold for the purpose. This will ensure a clean cut.

Having settled upon some satisfactory way to trim the prints, the next question is, "How much shall I trim off?" The beginner usually errs in taking off too little rather than too much. Often the effect of the picture is spoiled by having too much of it taken up by a plain, uninteresting foreground. Whatever may have been the cause of this, such as neglect to

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raise either the lens or the camera itself, the only remedy now is the use of a ruthless hand in trimming. Much of this can be avoided by a more careful study of the picture on the groundglass. In trimming, care should be taken also that the edges of the picture are square with one another and the horizon line if this is visible.

Mounts. — Regarding the choice of mounts, the general taste nowadays is toward quiet colors, gray being the favorite. It is usually held that the object of mounting a print is to separate it from its surroundings so that the entire attention of the observer is concentrated upon the print itself; consequently, the mount or the frame should be so chosen as not to interfere with this effect. But if possible, the mount ought to go further than this, and enhance the good features of the photograph. The possible effect of placing different colors, or light and dark, side by side, should not be neglected. A print always looks darker when mounted on a light background, and *vice versa*.

Mounting. — Anyone who is going to mount a large number of prints will probably prefer to make his own paste, but for mounting an occasional print it is better to use the ready-made variety. That which comes in collapsible tubes is very convenient, as a small amount can be used at a time without having it dry on the surface.

Most prints are best mounted while wet. Some kinds of paper will curl when soaked in water and require to be "flattened." Lay a clean piece of glass in the bottom of a tray, cover it with water, lay the prints face down on the glass, pressing them firmly down with one hand, remove the glass with the prints, stand

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it up on edge for about five minutes to drain and the prints will give no more trouble. Squeegeed prints are best mounted dry, as wetting them will remove the gloss. It is best, however, to wet the print slightly on the back, as the paste then goes on more smoothly and the print will stick to the mount with less rolling. The roller should never be applied directly to the face of the print, since it may carry paste from one to another, but a piece of waxed paper or a pure photographic blotter should be laid over the face of the print to protect it. Always go over the dry print, if not squeegeed, with a damp cloth to remove any paste that may have been transferred to it. A good flour-paste may be made by mixing a little flour with cold water, and then pouring boiling water on it.

Dry mounting tissue is an excellent mountant, as it will not cause even the thinnest mount to curl. It is placed between the print and the mount and fastened by pressing with a hot iron.

Finally. — You may find it necessary to read this little booklet several times before you start out to take your first picture. After a while you may purchase books a little more advanced. Every amateur should subscribe to at least one photographic magazine, such as *American Photography*. You will find it a constant help and stimulus in your work, and the editors are always glad to answer any questions you may ask about your difficulties.

By the time you have become familiar with the operation of your camera and have a fair idea of the processes of exposure and development to enable you to obtain a negative, and of printing and toning to enable you to obtain a finished photograph, you will

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want to know more about indoor and outdoor work. We have, therefore, selected three subjects to speak of more fully, *viz.:* portrait work, landscape work and interior work.

Portraiture at Home — The Lighting. — In portraiture the question of illumination is all-important. If this question of lighting is a problem demanding serious consideration on the part of the professional worker with his spacious gallery and ample skylight, it will readily be seen how vexatious a question it is to the amateur who is usually obliged to be content with the light from an ordinary window. This light may be sufficient in intensity, it is true, but it is a concentrated light, which is greatly emphasized on one side of an object while hardly penetrating the shadow on the other side.

Yet by proper management of this source of light surprising results can be obtained. Better results can usually be secured in a room than outdoors because the light outside is such a broad, open one that it is impossible to get those fine gradations of light and shade which are so essential to a pleasing portrait. If possible, a room with a north window should be chosen, since the light will vary less during the day. The higher up the window is placed the better, since it gives more top light. If it is necessary to work near a low window, a better lighting of the face and shoulders may be secured by covering the lower part of the window with a dark shawl.

In an Ordinary Room. — A good window lighting may be secured as follows. The sitter should be placed the same distance from the window that it measures in width and on a line with the side of the

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window casing farthest from the camera. Now cover the window with a shawl or opaque blind, with its upper edge level with the top of the sitter's head. Bring the camera about half the distance from the window that the subject is, i.e., work nearer the window so as to take more of the lighted than of the shaded side of the face. Having focused, ask the sitter to turn the head slowly away from and then slowly towards the window. A good position is with the light falling strongest on the forehead but crossing the bridge of the nose and lighting the cheek on the shaded side. In this position the shadow of the nose will come about half-way down the upper lip. If you can see the color of the flesh in the deepest shadow, a reflector is not needed, but if you cannot see color on both sides of the face it is best to hang cheesecloth over the window and use a sheet as reflector until the flesh tints are plainly visible on both sides.

Test the light with the Watkins meter and give the full exposure indicated, and you will never say that a studio light is *necessary* for good results.

A Simple Studio. — For the portrait work that the writer has done he has used a corner of the carriage house. This makes a very good studio, as any amount of light can be secured by opening the large sliding doors, which are about twelve feet high, and by screening the lower part a fairly good " top light " can be obtained. The window is generally covered with a dark cloth. The sitter is placed about four feet in front of the background and about five feet from the door and about the same distance behind it. By the use of the reflector (white cloth tacked to a

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wooden frame, or even a sheet on a chair), light may be thrown upon the shadow side of the face. The camera may be easily moved about so as to give any desired view.

Background. — The minor accessories needed are easily made or purchased. Cameras with short bellows can be helped by using an extra "portrait lens." For bust pictures a small background mounted on a roller or a frame can be cheaply obtained. For a longer background a gray blanket or colored felt hung in folds over a line stretched behind the sitter is good. A regular background is much to be preferred to wall paper.

Place the sitter far enough from the background to avoid the appearance of being pasted on it. Three or four feet will be about right. Regulate the distance from the window by the amount of light, and also to a certain extent by the character of the subject. It is often impossible to work in a subdued light because the necessary exposure is rendered too long. By working nearer to the window the light will be stronger, but at the same time is liable to cause too harsh contrasts. If necessary the window should be screened with thin muslin. Do not use any but a large stop. It is sometimes better for portions of the subject to be a trifle out of focus, as it gives more roundness. Always get the little sparks of light in the eyes — the catch-lights — sharp, and then soften the focus, if that is thought to be desirable, by racking the lens out (or the back of the camera to the rear) so as to bring the sharpness forward and let the back of the head and the ground be less distinct. The modern soft-focus lens is excellent for

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portraiture, because of its speed and the fact that its spherical errors soften skin defects and make it unnecessary to retouch if the lighting is good.

The Pose. — The arrangement of the figure or the pose in a portrait is usually regarded as a difficult matter, because the worker lacks that confidence in himself which comes from experience and from a knowledge of his subject. A bust portrait is generally undertaken because it is the easiest. The usual difficulty in a pose of this kind comes from an unnatural relation between the head and the body. If the subject is comfortably seated the head will often assume a natural and easy attitude. As a general thing, the less the photographer handles or manipulates his subject, the more unconstrained and easy will be the expression obtained.

Look out for Big Hands. — Above all things avoid what is called distortion. You have often seen pictures, perhaps of a horse taken from in front, in which the horse's head looked very large, the rest of his body far away. This illustrates what is meant by distortion. The farther away you place the subject from the camera the less likelihood there will be of your getting a distorted picture. Be careful that the subject's head is not too far forward or the hands too far to the front.

Use of Supplementary Lens. — By using one of the supplementary portrait lenses on the market better effects may be obtained. These little lenses fit over the front of the regular lens, and are made for fixed focus cameras, kodaks and regular folding plate cameras.

Other Hints. — Do not use a low chair with wide

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projecting arms; a piano stool is much better. Stout people are better taken standing than sitting.

Take special notice of the eyes. Have them follow in general the line of the face, turned toward rather than from the camera, and avoid all fancy or strained positions.

One more point — and a by no means unimportant one. Have everything ready as far as possible before posing the sitter, so that the time of waiting may be as short as it can be made. Too long a wait distracts the attention. This is especially necessary where old people or children are to be photographed. There are many other things to learn about portrait work and about the improvement of negatives for portrait work, and the subjects are treated more fully in No. 6 and No. 9 of this series, *How to Make Portraits* and *How to Retouch Negatives*.

Landscape Photography. — Landscape photography, even if it did nothing more for its followers than to lead them outdoors into the bright sunshine and fresh air, would be of great service. But it does far more than this. It teaches something of the beauty of nature, it enlarges the horizon, it shows things of beauty which were never observed before. For the aim of the enthusiastic landscape photographer is not an exact portrayal of what is before him, but the production of a picture, of a composition which shall convey some thought or story.

Scenes Right Around Us. — First let it be stated emphatically that it is not necessary to make long journeys for the purpose of securing beautiful landscapes. There is plenty of artistic material right at

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our doors. It is one of the chief benefits of this branch of photography that it teaches us to see beauty in the quiet pool or the little nook that we once passed by as commonplace. One who cannot find these opportunities at home will not find them at a distance, that is sure.

As landscapes are seldom seen to the best advantage under the bright glare of a noonday sun, photographs taken under the same circumstances are not usually the most pleasing. Furthermore, the result will be even worse than the original from the tendency of photography to exaggerate contrasts of light and shade. Hence it is better as a general thing to avoid taking views when the sun is at its height, but to take them in the morning or the evening when the shadows are longer or else while the sky is covered with fleeting clouds which vary the distribution of light from moment to moment.

Care in Selection. — The point of view from which the picture is taken should be studied carefully for the best results. It is seldom that the one which seems the most convenient and natural is the best. It is not always possible to tell which views will look best until they are examined on the groundglass; it may be necessary to stand more to the right, more to the left, higher or lower, but all this is most excellent practice even if no picture be the result. Do not be deceived by beauty due to different colors, since this will be all lost in the photograph. To avoid this it is sometimes a good plan to view the scene through smoked or blue glass.

The foreground often constitutes the picture, and this fact should be given due prominence in arrang-

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ing it; middle ground and distance are insufficient alone to form a picture, but combined with the foreground make an artistic and pleasing whole. The center of the picture is the weakest portion of it, therefore none of the objects which are really prominent should be placed in the exact center. The direction of the principal lines, too, should be taken into consideration.

It is a good plan to make a view-meter by cutting a hole the same proportions as your plate in a piece of dark card. Tie a string to one end and in the string place knots at distances equal to the foci of your lenses. Then by placing the right knot against the cheek-bone and sighting with one eye you will see the composition as it would look on the plate.

Beauty in Little Things. — There is great beauty oftentimes in trifling objects. Shrubs and vines, rocks and logs often can be carelessly arranged so as to break up the monotony of the foreground and give it an entirely different expression. Anything that breaks the level and changes the stiff lines gives pleasure to the eye, because of the character it gives. Scarcely anything can mar the effect so much as an unbroken foreground, such as a long expanse of grass of uniform lighting. The artistic photographer will change his position to avoid it, or if this is impossible, will place some objects where they will aid his lines.

Introduce Figures. — Many ordinary views need only proper lighting, and perhaps the introduction of a figure or two, to make a most pleasing picture. In introducing figures, however, take care that they are not placed looking directly at the camera, as is often done. If the view is one of a little woodland

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lake, for example, would it not be better to have a man leaning against a tree looking at the scene and apparently unaware of the photographer's presence, than to have him standing with his hands by his sides, looking directly at the camera? Figures which are not appropriately dressed or occupied should be left out entirely or else banished to the mid-distance.

Finally, never be satisfied with "good enough." If not confident that the view is the very best you can get, do not take it. Wait perhaps for another opportunity; study it. By doing this you will soon discover at what hour the effect is best and can choose that time for your work. Accordingly your picture will surpass in a corresponding measure that of a hasty or superficial person who takes the view as he finds it.

Seashore and Marine Work. — We must say something about making exposures at the seashore and on the water, as amateurs spoil thousands of rolls of film and boxes of plates every summer simply because they do not realize that the light on the water and on the sands is much more intense than elsewhere on account of the reflection. On a bright day an exposure on the water does not require more than one-quarter what you would give an average inland landscape at the same time. Look out for overexposure in this work, therefore. Use a medium opening of the diaphragm and study your exposure table carefully.

Non-halation plates are very good to use in this work. They do not cost much more than the regular plates and certainly give greater satisfaction. In fact, for any subject where the reflection of light is

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very strong, it is better to use non-halation plates. Many of the best workers use only the double-coated ortho plates for all classes of work, and the plan has many very great advantages.

Interior Photography. — Most of the difficulties which make interior photography harder than out-door work can be traced directly to one or two causes, either the limited amount of space available or the concentration of the light, and of the two, the second is probably the worse. Out of doors there is a great abundance of light and it is scattered or diffused in every direction, so that the question of illumination does not often require extended consideration. In a room the conditions are very different. The light is not so thoroughly diffused and there is not a great deal at best. Since the light enters the room through a limited number of comparatively small openings, the tendency is for it to be concentrated in certain spots to the exclusion of others.

Lighting. — For this reason the problem of illumination does not resolve itself into the simple question of how much to lengthen the exposure, but requires some study of the source and distribution of the light. In regard to the first point, much can be done by the exercise of good taste and the skilful handling of materials. While it is true that an ordinary room is much smaller than the bit of woodland that we might choose for an outdoor view, it is for this very reason much more convenient and practicable to change it to suit our own ideas of what an interior should be. It is manifestly impossible to include the four sides of a room in one picture; indeed, most of us, having only a medium or narrow-angle lens, will

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fall far short of it; for this reason it is best to choose some particular corner which offers the least difficulty in the way of windows, drapery, etc. Remember, too, that the scope of the lens decreases quite sensibly with the distance, so that it is not of much use to try to photograph too small a room.

Arrangement of Furniture. — When you have decided upon a particular corner, do not think that all the furniture in the room must be piled in that corner. Do not change it at all, for it probably looked quite well at the beginning, otherwise you would not have chosen it. And, by the way, do not think that the foreground must be absolutely bare space. Let the corner of a chair or table project a little into the field of the lens; if it is not too near the camera, it will improve the picture. Endeavor to have the room look inhabited. If a sofa is shown, have the cushions somewhat tumbled rather than propped up with mathematical precision; if a table, have a half-open book placed carelessly upon it; a violin, for example, with its bow and the sheet of music laid across it, apparently as if the musician had but just left it, will illustrate just the effect which we wish to produce. Those who have seen the old-fashioned country parlor or "best room" with its black hair-cloth furniture primly arranged and everything scrupulously symmetrical will understand what it is desirable to avoid.

What to Avoid. — Whenever a mirror or picture is included in the field of view, look out for reflections or perhaps more will be shown than was originally intended. It is also desirable to avoid strong contrast. This is one of the evils consequent upon

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the concentration of light and can often be avoided by lessening the amount of light which is admitted to the room and giving a longer exposure. Try to get a uniform lighting, even if you have to darken the room so much that an exposure of an hour or two is needed. A supplementary flash can often be used with advantage. In this connection a word of caution may not be amiss, and that is, when giving a lengthened exposure, first secure the door and thus be safe from interruption. A dull day is often better than a sunny one, as the diffusion of light inside the room is more even.

General Hints. — Having now settled the main points, a few brief suggestions may be of help:

A view into another room is often to be preferred to a blank expanse of white door.

Place your eye near the lens and look carefully for reflections from mirrors, glass-covered pictures, etc.

If the room is dark, focus on a candle or lamp-flame or rub a little glycerine on the groundglass.

Focus sharply on a point about one-third of the extreme distance from the camera.

If the floor is slippery, stick the points of the tripod into corks, or use a tripod-stay.

Use non-halation or backed plates if possible, preferably double-coated ortho.

The exposure for an interior is best determined by the use of an exposure meter. Mr. Watkins recommends to use such a stop that the camera exposure and the meter test shall be equal. One-sixteenth, one-quarter, or the whole tint may be used, according to the plate and the stop used. Do

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not overdevelop interiors. More water in the developer and care to take the plate out before all the image is through to the back are essentials.

Finally, take plenty of time; do not let your friends hurry you. Look everything over after things are all ready and you are about to make the exposure. If the writer had done this once he might have noticed that the large advertisement card that he had focused on was still the most prominent thing in the room (and likewise the picture).

Enlarging. — In these days of the popularity of the miniature camera, to say nothing about enlarging in a manual of this kind would be a serious omission, for the effectiveness of pictures made with, for instance, a Vest Pocket Kodak or an even smaller camera, depends very much upon their being enlarged. And enlarging is not at all difficult or complicated, hardly more so than contact printing, so there is no reason why an amateur should hesitate to undertake it. Enlarging is merely rephotographing. The small negative from which an enlargement is required is simply photographed on a piece of bromide paper or other similar sensitive substance, and the size of the enlargement is governed by the distance between the lens and the projected image. An enlarger, in essence, consists of an arrangement for holding the negative that is to be enlarged and a lens and a camera for photographing it. The box-form enlargers are the most convenient, but the chief drawback to their use is the fact that the relative positions of the negative, the lens and the sensitive paper being fixed once and for all, the degree of enlargement is unalterable. When enlarging with a

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lantern, either by daylight or by artificial light, the size of the enlargement can be varied at will by altering the relative distances. Full descriptions of apparatus and more complete instructions as to their use may be had by referring to *Practical Photography* No. 5, *How to Make Enlargements*, and a practical photographer should not regard his photographic education as complete unless it includes some actual experience in making enlargements.

Flashlight. — Another subject that will be found not only useful but interesting is that of photography by artificial light. This branch of the work should appeal to the amateur as a new outlet for pictorial effort with small outlay but with infinite possibilities. The work is interesting to the photographer interested in portraiture because it places in his hands a means whereby he can indulge in endless experiments in lighting that would otherwise be denied him. It is interesting too, because by means of flashlight pictures can be secured under "home" conditions that would be otherwise impossible, and subjects and scenes can be photographed which could never be represented at all if daylight were the sole illumination. Flashlight can be used at times when daylight is poor to augment daylight and in winter, more especially, a knowledge of its capabilities is likely to be welcome to photographers who would otherwise regard their occupation as gone during the darkened months of the year.

There are several varieties of flashlight apparatus on the market, ranging from the simple and comparatively cheap lamp or the Eastman flashsheet or cartridge holder, to the expensive and elaborate flash-bag

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operated by electricity. The magnesium, "blow-through" variety of lamp is inexpensive and convenient in use. A flash-sheet, used with its proper holder, is very convenient and quite efficient. A lamp which uses flash powder, ignited by means of a percussion cap, is even better on some occasions because the flash is practically instantaneous and there is very little risk of movement during the exposure. Flash powder, sheets or cartridges must always be handled with great care. They are safe enough under proper conditions, but might be dangerous if handled carelessly.

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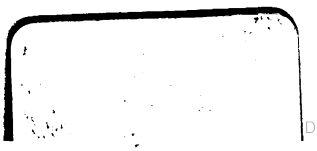

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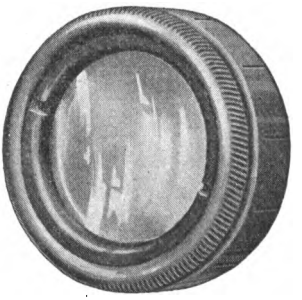

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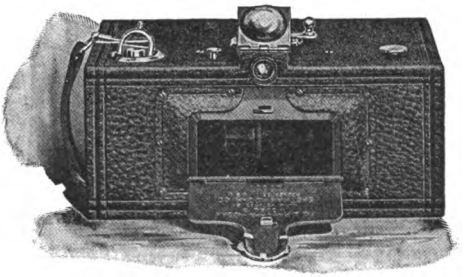

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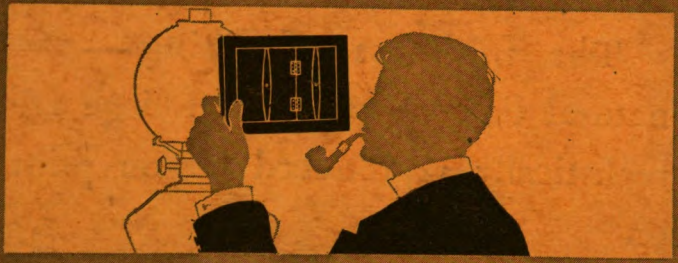

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